1,054,159

PATENT SPECIFICATION

NO DRAWINGS

1,054,159

Date of Application and filing Complete Specification: Oct. 29, 1965.
No. 45910/65.
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COMPLETE SPECIFICATION

Improvements in and relating to the Manufacture of Synthetic Sponges

ERRATUM

SPECIFICATION No. 1,054,159

Page 2, line 79, *for* "direct" *read* "dirt"

THE PATENT OFFICE
20th March 1967

other type as reinforcing material, and crystals of sodium sulphate decahydrate, which is very soluble in water and easily fusible; the paste thus formed is extruded into moulds, coagulated, fixed and washed to form a porous mass of regenerated cellulose, to which the usual finishing treatments are applied.

The porosity of the sponges obtained depends on the size of the hydrated sodium sulphate crystals used as pore-producing material. Large crystals are obtained by slow crystallisation of solutions of sodium sulphate and are very often composed of an agglomeration of relatively small crystals, thus producing cavities and irregularities which make the resultant mass rather fragile. These crystals have a low resistance to the stresses to which they are subjected during the mixing and extruding operations involved in the manufacture of sponges made of regenerated cellulose material; they break and thus limit

The present invention provides a process for the manufacture of synthetic sponges, wherein as pore-producing material there are used agglomerated crystalline masses of predetermined, preferably regular, uniform, shape obtained by compression in a suitably shaped mould of an easily soluble or fusible material suitable for pore production and of crystalline form.

By agglomeration there can be produced hard, regular crystals, which are resistant to the stresses imposed during the various manufacturing operations.

The method is of particular interest in the case of synthetic sponges of regenerated cellulose from viscose and of agglomerated hydrated sodium sulphate crystals as pore-producing materials.

Small-size crystals of hydrated sodium sulphate can be compressed by machines of the

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COMPLETE SPECIFICATION

Improvements in and relating to the Manufacture of Synthetic Sponges

We, SPONCEL LIMITED, a British Company, of 185 London, Road, Croydon, Surrey, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with improvements in and relating to the manufacture of synthetic sponges.

It is known to manufacture synthetic sponges, for example from regenerated cellulose, cellulose derivatives or polyvinyl alcohol, using to produce the pores in the sponge soluble or fusible pore-producing materials which are incorporated in a sponge matrix which is caused to solidify, and then are removed leaving the pores. Thus a well-known method for the manufacture of these sponges consists in preparing a paste composed of viscose, cotton fibres or hemp fibres or any other type as reinforcing material, and crystals of sodium sulphate decahydrate, which is very soluble in water and easily fusible; the paste thus formed is extruded into moulds, coagulated, fixed and washed to form a porous mass of regenerated cellulose, to which the usual finishing treatments are applied.

The porosity of the sponges obtained depends on the size of the hydrated sodium sulphate crystals used as pore-producing material. Large crystals are obtained by slow crystallisation of solutions of sodium sulphate and are very often composed of an agglomeration of relatively small crystals, thus producing cavities and irregularities which make the resultant mass rather fragile. These crystals have a low resistance to the stresses to which they are subjected during the mixing and extruding operations involved in the manufacture of sponges made of regenerated cellulose material; they break and thus limit the porosity potential of these sponges. In addition, because of the irregularity of their dimensions and surface, they produce irregular cells with walls which are not clean-cut and are often badly shaped.

The output of large crystals of hydrated sodium sulphate is reduced by the formation of powdery particles during mixing, which are no longer efficaceous for the formation of the pores.

It is also a known procedure in the manufacture of synthetic sponges to use granular sodium sulphate material, prepared by pounding or crushing crystalline masses obtained by fusion to a paste and re-crystallisation of hydrated sodium sulphate, with or without the addition of anhydrous sodium sulphate. The execution of this method needs great care, since in the course of the paste fusion, anhydrous sodium sulphate may very easily be deposited, which very quickly disturbs operations.

The present invention provides a process for the manufacture of synthetic sponges, wherein as pore-producing material there are used agglomerated crystalline masses of predetermined, preferably regular, uniform, shape obtained by compression in a suitably shaped mould of an easily soluble or fusible material suitable for pore production and of crystalline form.

By agglomeration there can be produced hard, regular crystals, which are resistant to the stresses imposed during the various manufacturing operations.

The method is of particular interest in the case of synthetic sponges of regenerated cellulose from viscose and of agglomerated hydrated sodium sulphate crystals as pore-producing materials.

Small-size crystals of hydrated sodium sulphate can be compressed by machines of the

[*Price*

usual type, e.g. agglomerating apparatus known for coal-dust pellets, where the crystals pass between two compression drums which have depressions in the surfaces corresponding to the shape of the agglomerates that it is required to obtain. Under the effect of the pressure, partial fusion is produced on the surface of the individual crystals, so that during the re-crystallisation occurring when the mass is freed from pressure, the crystals forming the pore-producing mass can be consolidated to stronger products.

The hardness of the agglomerated pore-producing mass can be increased either by eliminating part of the hydration water or by incorporating anhydrous sodium sulphate, which thus increases the actual salt content of the mass.

The addition of anhydrous sodium sulphate also avoids adhesion of individual agglomerates of pore-producing material to one another, which may otherwise occur when they come into contact after release of pressure.

Anhydrous sodium sulphate can be added in any suitable proportions limited by the solubility and fusion temperature of the mass obtained. The cost of the material is also a factor. Advantageously, the proportion is between 0.5 and 15% by weight, preferably between 3 and 8% by weight.

The agglomerated pore-producing crystals can be of any suitable shape. It is an advantage to choose the tetrahedral form, being the most simple and, depending on the position of the pore-producing mass in the viscose, producing differently orientated pores, thereby achieving an advantageous effect.

The dimensions of these agglomerated crystals may also vary.

The following Example illustrates the invention:

EXAMPLE

10 kg. of hydrated sodium sulphate crystals passing through a 3 mm screen are mixed with 0.75 kg. of anhydrous sodium sulphate and compressed under a pressure of 1.3 metric tons/sq. cm. between two cylinders which have depressions allowing the formation between them of tetrahedra having faces each of an area of 1 sq. cm.

The faces of the tetrahedra may be flat or curved.

The product produced is then kept, preferably for a minimum period of 2 hours, after leaving the agglomerating apparatus, at the end of which time the compressed shapes have acquired an increased rigidity. The product is then mixed with viscose containing fibrous reinforcing material. Thus 280 grams of viscose with 10% by weight of cellulose containing 30 grams of fibre cut into lengths of 7 cm. may be mixed with 400 grams of compressed sodium sulphate prepared according to the method described above. The paste thus obtained is then moulded, and the blocks are coagulated according to known methods and subjected to the usual finishing treatments.

In this manner, synthetic sponges made of regenerated cellulose are obtained in which the pores are of approximately the same dimensions as the pores of natural sponges and the cavities are well-formed, defined by a clean-cut "skin", which allows better absorption of aqueous liquids, thereby improving the wiping qualities, and better cleaning, since the direct collected by the sponge does not penetrate deeply into it, but remains on the "skin". Sponges obtained by this method are also more supple.

In addition, this method allows the use of small crystals easily obtained by rapid crystallisation of a hydrated sodium sulphate solution, and leads to improved output from the crystallisation of the sodium sulphate. In fact, the whole of the hydrated and anhydrous sodium sulphate used in the manufacture of sponges made of regenerated cellulose is utilised for the formation of the pores.

In other methods other dimensions and shapes could be used for the agglomerates, for example cubic crystals could be produced, although the tetrahedron gives better orientation effects. In place of hydrated sodium sulphate, any other fusible or easily soluble product can be used which is capable of producing under pressure, masses which are sufficiently solid to survive without breaking the various processes in the preparation of the paste used for the manufacture of regenerated cellulose sponges.

Although the invention has been described in particular for synthetic sponges made of regenerated cellulose, the invention can also be applied to synthetic sponges based on other absorbent materials, e.g. certain cellulose derivatives or polyvinyl alcohol.

WHAT WE CLAIM IS:—

1. A process for the manufacture of synthetic sponges, wherein as pore-producing material there are used agglomerated crystalline masses of predetermined shape obtained by compression in a suitably shaped mould of an easily soluble or fusible material suitable for pore production and of crystalline form.

2. A process as claimed in claim 1, wherein as base for the synthetic sponge viscose is used.

3. A process as claimed in claim 1 or 2, wherein agglomerated sodium sulphate decahydrate is used as pore-producing material.

4. A process as claimed in claim 3, wherein an agglomerate is used of sodium sulphate decahydrate with 0.5 to 15% by weight, more especially 3 to 8% by weight, of anhydrous sodium sulphate.

5. A process as claimed in any one of claims 1—4, wherein the agglomerated masses are of regular, uniform shape.

6. A process as claimed in claim 5, wherein the masses are of tetrahedral shape with flat or curved faces.

7. A process as claimed in claim 6, wherein each tetrahedral face has an area of 1 sq. cm. (subject to manufacturing tolerances).

8. A process as claimed in any one of claims 1—7, wherein as pore-producing material agglomerates as specified are used in conjunction with other pore-producing material.

9. A process as claimed in claim 1, substantially as described in the Example herein.

10 Synthetic sponges, when made by the process claimed in any one of claims 1—9.

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